

CLAIMS

WHAT IS CLAIMED IS:

1. An FIR filter comprising:

a first operational unit for operating input data which consists of transmitting
5 information and is composed of bit strings, and additional data which is added in order to
transmit said input data and;

a second operational unit for operating previous data among said input data and a
difference between said additional data corresponding to the previous data and said
additional data corresponding to present data among said input data; and

10 an adding unit for adding results of the first and second operations and outputting
the resultant as a filter response.

2. The FIR filter according to claim 1, further comprising

a data separation unit for separating data inputted to the filter into said input data
and said additional data.

15 3. The FIR filter according to claim 1, further comprising:

a shift register for receiving said input data in sequence; and
factor multipliers for multiplying outputs from each of delay elements of said shift
register by tap factors, and wherein:

said first operational unit includes a first adder tree for adding outputs from said
20 factor multipliers and a first multiplier for multiplying an output from said first adder tree by
said additional data;

said second operational unit includes a second adder tree for adding said previous
data among said outputs from said factor multipliers and a second multiplier for multiplying
an output from said second adder tree by said difference; and

25 said adding unit adds an output from said first multiplier and an output from said

second multiplier.

4. The FIR filter according to claim 3, further comprising switches for connecting outputs of said factor multipliers to said second adder tree, wherein

5 said switches are switched on and off in response to a shift operation of said input data in said shift register and transmit said previous data to said second adder tree.

5. The FIR filter according to claim 4, wherein said switches are switched off in response to every shift operation of said shift register, the switching-off being performed in sequence, starting from a switch corresponding to one of said factor multipliers at an input side.

6. The FIR filter according to claim 3, further comprising switches for connecting said second adder tree to one of an output of a predetermined one of said factor multipliers and an output of a predetermined one of adders which compose said first adder tree, wherein said switches are switched on and off in response to a shift operation of said input data in said shift register and transmit said previous data to said second adder tree.

7. The FIR filter according to claim 1, further comprising: a holding circuit for accepting said additional data in response to a change in said input data and holding the accepted data as said additional data corresponding to said previous data; and

20 an operational circuit for operating a difference between said additional data outputted from said holding circuit and new additional data.

8. An FIR filter comprising: a first operational unit for operating present data among input data which consists of transmitting information and is composed of bit strings, and additional data which is added in order to transmit said present data;

a second operational unit for operating previous data among said input data and said additional data corresponding to said previous data; and

an adding unit for adding results of the first and second operations and outputting the resultant as a filter response.

5 9. The FIR filter according to claim 8, further comprising

a data separation unit for separating data inputted to the filter into said input data and said additional data.

10. The FIR filter according to claim 8, further comprising:

a shift register for receiving said input data in sequence;

10 factor multipliers for multiplying outputs from each of delay elements of said shift register by tap factors; and

switches being switched on and off in response to a shift operation of said input data in said shift register, for transmitting outputs from said factor multipliers to one of said first operational unit and said second operational unit.

15 11. An FIR filter comprising:

a first operational unit for adding present data among input data which consists of transmitting information and is composed of bit strings;

a second operational unit for operating previous data among said input data and a ratio of said additional data corresponding to said previous data to said additional data
20 corresponding to said present data;

an adding unit for adding an output from said first operational unit and an output from said second operational unit; and

a multiplying unit for multiplying an output from said adding unit by said additional data corresponding to said present data and for outputting the resultant as a filter response.

25 12. The FIR filter according to claim 11, further comprising

a data separation unit for separating data inputted to the filter into said input data and said additional data.

13. The FIR filter according to claim 11, further comprising:

a shift register for receiving said input data in sequence;

5 factor multipliers for multiplying outputs from each of delay elements of said shift register by tap factors; and

switches being switched on and off in response to a shift operation of said input data in said shift register, for transmitting outputs from said factor multipliers to one of said first operational unit and said second operational unit.

10 14. The FIR filter according to claim 11, further comprising:

a holding circuit for accepting said additional data in response to a change in said input data and holding the accepted data as said additional data corresponding to said previous data; and

an operational circuit for operating a ratio of said additional data outputted from said

15 holding circuit to new additional data.

15. A method of operating an FIR filter, comprising the steps of:

receiving in sequence input data which consists of transmitting information and is composed of bit strings;

operating said input data and additional data which is added in order to transmit said
20 input data;

operating previous data among said input data and a difference between said additional data corresponding to said previous data and said additional data corresponding to present data; and

adding results of said operations and outputting the resultant as a filter response.

25 16. A method of operating an FIR filter, comprising the steps of:

receiving in sequence input data which consists of transmitting information and is composed of bit strings;

operating present data among said input data and additional data which is added in order to transmit said present data;

5 operating previous data among said input data and said additional data corresponding to said previous data; and

adding results of said operations and outputting the resultant as a filter response.

17. A method of operating an FIR filter, comprising the steps of:

receiving in sequence input data which consists of transmitting information and is

10 composed of bit strings and;

adding present data among said input data;

operating previous data among said input data and a ratio of said additional data corresponding to said previous data to said additional data corresponding to said present data;

15 adding results of said operations;

multiplying the addition result by said additional data corresponding to said present data; and

outputting the multiplication result as a filter response.

18. A semiconductor integrated circuit including an FIR filter, wherein

20 the FIR filter comprises:

a first operational unit for operating input data which consists of transmitting information and is composed of bit strings, and additional data which is added in order to transmit said input data;

a second operational unit for operating previous data among said input data and a
25 difference between said additional data corresponding to the previous data and said

additional data corresponding to present data among said input data; and

an adding unit for adding results of the first and second operations and outputting the resultant as a filter response.

19. A semiconductor integrated circuit including an FIR filter, wherein

5 the FIR filter comprises:

a first operational unit for operating present data among input data which consists of transmitting information and is composed of bit strings, and additional data which is added in order to transmit said present data;

10 a second operational unit for operating previous data among said input data and said additional data corresponding to said previous data; and

an adding unit for adding results of the first and second operations and outputting the resultant as a filter response.

20. A semiconductor integrated circuit including an FIR filter, wherein

the FIR filter comprises:

15 a first operational unit for adding additional data corresponding to present data among input data which consists of transmitting information and is composed of bit strings;

a second operational unit for operating previous data among said input data and a ratio of said additional data corresponding to said previous data to said additional data corresponding to said present data;

20 an adding unit for adding an output from said first operational unit and an output from said second operational unit; and

a multiplying unit for multiplying an output from said adding unit by said additional data corresponding to said present data and for outputting the resultant as a filter response.

21. A communication system for transmitting data filtered by an FIR filter, the

25 communication system comprising:

a first operational unit for operating input data which consists of transmitting information and is composed of bit strings, and additional data which is added in order to transmit said input data;

a second operational unit for operating previous data among said input data and a
5 difference between said additional data corresponding to the previous data and said additional data corresponding to present data among said input data; and

an adding unit for adding results of the first and second operations and outputting the resultant as a filter response.

22. A communication system for transmitting data filtered by an FIR filter, the
10 communication system comprising:

a first operational unit for operating present data among input data which consists of transmitting information and is composed of bit strings, and additional data which is added in order to transmit said present data;

a second operational unit for operating previous data among said input data and said
15 additional data corresponding to said previous data; and

an adding unit for adding results of said first and second operations and outputting the resultant as a filter response.

23. A communication system for transmitting data filtered by an FIR filter, the communication system comprising:

20 a first operational unit for adding present data among input data which consists of transmitting information and is composed of bit strings;

a second operational unit for operating previous data among said input data and a ratio of said additional data corresponding to said previous data to said additional data corresponding to said present data;

25 an adding unit for adding an output from said first operational unit and an output

